R E P O R T R E S U M E S

ED 012 284 UD 003 484

EXPERIMENTS WITH TOKEN REINFORCEMENT IN A REMEDIAL CLASSROOM.

BY- WOLF, MONTROSE M. AND OTHERS

PUB DATE 66

EDRS PRICE MF-$0.09 HC-$1.04 26P.

DESCRIPTORS- *AFTER SCHOOL PROGRAMS, *REMEDIAL INSTRUCTION, *LOW ACHIEVERS, GRADE 5, GRADE 6, *REINFORCEMENT, ACADEMIC ACHIEVEMENT, GRADE POINT AVERAGE, REPORT CARDS, CONTROL GROUPS, INSTRUCTIONAL MATERIALS, EDUCATIONAL EXPERIMENTS, ATTENDANCE, EVALUATION, DISADVANTAGED YOUTH, PROGRAM COSTS, REWARDS, READING INSTRUCTION, ARITHMETIC, RESEARCH METHODOLOGY, STANFORD ACHIEVEMENT TEST

IN AN AFTER-SCHOOL REMEDIAL EDUCATION PROGRAM 16 FIFTH- AND SIXTH-GRADE URBAN DISADVANTAGED STUDENTS WERE TAUGHT TO MASTER STANDARD INSTRUCTIONAL MATERIALS WITH THE SUPPORT OF TOKEN REINFORCEMENTS. THE STUDENTS HAD SCORED 2 YEARS BELOW THE READING NORM ON THE STANFORD ACHIEVEMENT TEST, AND THEIR MEDIAN IQ WAS 88. TOKEN POINTS WERE MANIPULATED RELATIVE TO THE AMOUNT AND/OR DIFFICULTY OF SUCCESS WITH THE ASSIGNED PROBLEMS. POINTS EARNED WERE REWARDED BY A VARIETY OF GOODS AND SPECIAL EVENTS (TREATS) WHICH WERE HIERARCHICALLY RANKED, THAT IS, LONG RANGE GOALS WITH MORE VALUABLE REWARDS REQUIRED MORE TOKEN POINTS. THE RELATIONSHIP BETWEEN THE RATE OF CERTAIN ACADEMIC BEHAVIOR AND THE TOKEN SYSTEM AND ITS CONTINGENCY WITH ACHIEVEMENT. OTHER CONTINGENCIES BUILT INTO THE PROJECT, NOT EXPERIMENTALLY ANALYZED, INCLUDED A MONEY BONUS FOR THE TEACHERS WHICH WAS LINKED TO THEIR STUDENTS' PRODUCTIVITY AND PERMISSION TO STUDENTS TO PURSUE FAVORITE SUBJECTS OR MORE ADVANCED WORK ONLY IF THE LESS POPULAR TASK WAS COMPLETED. OTHER TOKEN EARNING CONTINGENCIES WERE ATTENDANCE, GOOD BEHAVIOR, AND IMPROVEMENT IN GRADE AVERAGE. COMPARED WITH A CONTROL GROUP HAVING NO REMEDIATION, THE REINFORCEMENT GROUP GAINED AN AVERAGE OF 1 YEAR IN ACHIEVEMENT LEVEL AND 6 MONTHS IN THEIR PREVIOUSLY ACCUMULATED DEFICIT. ATTENDANCE AVERAGE 85 PERCENT AND MEDIAN REPORT CARD GAIN WAS 1.1 GRADE POINTS (C AVERAGE). (NH)

EXPERIMENTS WITH TOKEN REINFORCEMENT IN A REMEDIAL CLASSROOM [1]

Montrose M. Wolf
David K. Giles
Vance R. Hall
University of Kansas

This report describes results of the first year of an after-school, remedial education program for low achieving 5th and 6th grade children in an urban poverty area. The remedial program incorporated standard instructional materials, mastery of which was supported by token reinforcement. Experimental analyses carried out with individual students showed the token reinforcement to function as such. The effects of the program on the academic achievement and report card grades of the children in the remedial group were found to be significant when compared with the gains of a control group who had no remedial program.

EXPERIMENTS WITH TOKEN REINFORCEMENT IN A REMEDIAL CLASSROOM[1]

Montrose M. Wolf, David K. Giles
and Vance R. Hall

University of Kansas

Token reinforcement systems have now been used many times to develop and maintain useful human behaviors in institutional settings (e.g., Ayllon and Azrin, 1965; Birnbrauer, Wolf, Kidder, and Tague, 1965; Cohen, Filipczak, and Bis, 1965; Lent, 1966; and Staats and Butterfield, 1965). In the present research, we created a token economy designed to develop and maintain the academic behavior of low achieving children in a community setting. This report describes the results from the first year of an after-school, remedial education program for low acieving 5th and 6th grade children in an urban proverty area. The remedial program incorporated standard instructional materials, mastery of which was supported by token reinforcement. Experimental analyses of the function of the tokens were carried out with individual students. The effects of the program were evaluated by comparing the academic achievement and report card grades of the remedial group with that of a control group who had no remedial program.

GENERAL PROCEDURES

Students

Pupils from two elementary schools located in a low income neighborhood of Kansas City, Kansas, attended a remedial education program during the summer of 1965, the 1965-66 school year, and the summer of 1966. Fifteen of the 16 students entered the 6th grade and one student entered the 5th grade in the fall of 1965. All of the students had scored at least two years below the norm for their grade level on the reading section of the Stanford Achievement Test (SAT) administered by the public schools during the 1965 spring term which preceded our program.

According to the pupils' school records, their median I.Q. was 88 (range 73-104), median SAT reading grade level score was 3.4, and the median SAT total battery grade level score was 3.6. Their median six-weeks report card grade average from the previous year was 4.1, on a scale where A=1.0 and F=5.0.

The program began with five children during the summer of 1965. After five weeks, five more children were added. In the fall, one more student[2] (the 5th grader) was enrolled at the beginning and five additional students added at the end of the first six-weeks period. The last student was enrolled at the end of the second six weeks.

In most instances the children belonged to families of more than five children who received welfare support. In the majority of the homes no father was present.

The children's parents were contacted by a social worker who explained the program and gave the parents the opportunity to have their children attend. All of the parents who were contacted enrolled their children, usually during the first visit. (One parent was visited four times before he made his decision, however.)

Token Reinforcement System

The reinforcement procedure resembled a trading stamp plan (e.g., S & H Green Stamps). Each child was given a folder containing groups of four different-colored pages, each page approximately 3 x 3 inches in size. Blue, yellow, and pink pages were divided into one hundred quarter-inch squares; green pages were divided into sixty quarter-inch squares. After a child completed an assignment correctly, he was given points by the teacher, who marked the squares of the appropriately colored pages with a felt pen.

When a child first joined the program, points were often given after each problem that was worked correctly. As the student acquired a higher rate and more accurate output, the amount and/or difficulty of work required to obtain points was gradually increased.

The number of points to be given a child for particular work was decided by the teacher. This decision sometimes was determined partially through negotiation with the child.

Filled pages of points were redeemable, according to their color, for a variety of goods and events:

Blue pages for weekly field trips, such as circus, swimming, zoo, picnic, sporting events, movies; Green pages (the sixty square pages) for a daily snack of sandwich,

milk, fruit, and cookie; Pink pages for money and items available in the "store", such as candy, toiletries, novelties, and clothing;

Yellow pages for long range goals which might take several weeks or months to obtain such as clothes, inexpensive watches, and second-hand bicycles. Any child who had accumulated $2.00 worth of yellow tickets was eligible for a shopping trip to local department stores on a designated night of each week.

The face value of a filled page was 25 cents. However, the actual value of a page usually was something less than 25 cents. Many of the field trip events were free to the project, although the children needed from four to eight filled blue pages to be able to go. Also, snacks and store items were purchased wholesale and marked up to approximate typical store prices.

The children received an approximately equal number of points for each of three areas:

(1) Work completed and/or corrected in regular school and brought to the classroom, such as seat work, corrected homework, and tests. For a grade of A the students received 100 points; for B, 75 points; for C, 50 points; and for D, 25 points.

(2) Homework assignments and remedial work completed in the remedial classroom. The number of points given for items in an assignment varied widely as a function of the characteristics of the items and the repertoire of the particular child. Since these interacted to to determine the probability of correct answers and the length of time necessary for completion, both had to be considered beforehand when deciding the point values of items. Values ranged from as little as half a point per item to as high as 20 or 30 points for items that were especially difficult for a particular child.

(3) Six-weeks report card grades. The students were given grades by their regular school teacher in five academic subjects each six weeks. For each grade of A most students received 1,600 points; for B, 800 points; for C, 400 points; and for D, 200 points. Three children, however, who had made almost all failing marks the preceding year received double the above amounts.

Materials

A folder of remedial work was always to be found on each students desk. This folder consisted primarily of exercises in the student's weakest area, graded at an appropriate level

of difficulty. The reading materials included the Science Research Associates' Reading Laboratory and the New Practice Reader by the McGraw-Hill Book Company. The arithmetic workbooks were Arithmetic for Today by Chas. E. Merrill Books, Inc.; The Practice Workbook of Arithmetic by Treasure Books, Inc.; Adventures in Arithmetic by the American Book Company; and Practice for Arithmetic of the Lard Law Mathematics series. Language materials included Individual Corrective English workbooks by the McCormick-Mathers Pub. Co.; and '3' in One workbooks by Chas. E. Merrill Books, Inc.

The students' regular school texts were relied upon for academic materials in the areas of social studies and spelling. When suitable materials could not be found, teachers devised their own materials.

Program

The remedial group attended the classroom each weekday after school for 2 1/2 hours, and on Saturday mornings during the public school year, and each morning except Sundays for three hours during the summer months.

The summer program concentrated on reading, language, and arithmetic deficiencies indicated by the California Achievement Test. With the onset of the public school year, the curriculum also involved work relevant to the ongoing school curriculum. Emphasis was placed on homework assigned by the public school teacher, e.g., solving arithmetic homework, learning spelling lists, writing theme assignments, and preparing social studies projects. After the student completed such assignments, he engaged in remedial work in his deficient areas.

Facilities

The remedial classroom was located in the basement of a church located near the students' elementary schools. In-expensive card tables served as desks. These were placed along the walls of a large room and were enclosed on two sides by 4 x 4 ft. wooden partitions. Two small adjoining rooms were used to keep academic materials and some of the back-up reinforcers (the "store").

Personnel

The classroom was administered by one head teacher and, as the number of students increased, by two more teaching assistants. All are referred to below as instructors. Each instructor worked with five or six students, moving from one to another for short periods of individualized tutoring when necessary. Students were told to raise their hands when they had questions or had materials

ready for scoring. There was almost no formal lecturing, however, group participation activities often were led on Saturday morning.

Two Neighborhood Youth Corps employees assisted in the classroom. Their duties included scoring completed assignments, distributing the snack, and exchanging the tokens in the "store" at the end of the day.

EXPERIMENTAL ANALYSIS OF THE TOKEN REINFORCEMENT PROCEDURE

Experimental analysis of the relationship between the rate of certain academic behaviors in the classroom and the token system was accomplished in a number of ways. These involved either the modification or discontinuation of the token system and its contingency with achievement.

Experiment 1.

The students usually had a wide choice of materials in the remedial classroom and varied markedly in their selections of these materials. This experiment was to detemine whether the choice of materials by two students was at least partially a function of the distribution of the points.

Students. Two boys, identified as KT and AS, both in the 6th grade, were chosen for this experiment. Both had the same remedial instructor; one had a high rate and one had a low rate of completing reading sections in their New Practice Readers.

Response. The response consisted of completed units in the New Practice Reader. Each unit consisted of a story of approximately 200 words and a set of 12 or 13 questions. Half the questions were designed to test the student's comprehension of the reading material; half were designed to prepare the student's vocabulary for the story in the next reading section. The questions were multiple choice, true-false, and fill-in-the-blank in form. A dictionary was provided for the vocabulary portion. The number of points available for correct answers varied, but a 10 point bonus was given uniformly for a perfect score on either half of the questions. However, no points were given for any half unit if less than 50% of the questions were correct. Also, unless it met the 50% criterion, a half unit was not recorded as a response in the data analysis. In a unit where half was not counted, the other half was still recorded if it met the criterion.

Procedure. For several weeks of class sessions the number of points that the students could obtain from reading the story and answering the questions in the New Practice Reader was manipulated as shown in Table 1. For student, KT, after 19 days which established a base-line rate against which to compare the effects of subsequent point manipulations, the maximum number of points which could be obtained from each reading unit was changed from 90 to 52 points. After seven sessions, the number was shifted back to 90 points for eight sessions; then again to 52 points for five sessions; and finally back again to 90 points for 10 sessions. Points for student AS were increased from 60 possible points per reading unit to 120 points for 20 sessions and then back to 60 points for six sessions. The differences in design between KT and AS were because AS had never had a rate of reading under previous conditions.

Insert Table 1 about here

Each of the students was informed about the number of points that he could obtain for correct answers to questions whenever: 1) the number of points was changed, 2) the student inquired about what number of points could be earned, or 3) the student completed an assignment.

Results and Discussion. Experimental manipulation of the number of points earned by reading drastically modified the reading rates of both students, as shown in Figure 1. Each time KT's points for reading were decreased, his rate fell to almost zero. Doubling the number of points that AS could receive produced a modest rate of behavior, even though he had done no reading during the previous month. The results of Experiment 1 indicated that the points functioned as strong reinforcers for KT and AS.

Experiment II.

In Experiment 1 there were no observations of the effect of changing reading rate on the rates of other academic behavior. The second experiment was designed to determine the effects of point manipulations on three alternative behaviors (responses in three workbooks) and, at the same time, to extend the experimental analysis of the token reinforcement system to all of the students in the remedial program.

Students. The second experiment took place during the two-month summer session which followed the school year program. Eleven students began the summer remedial program two days after the

spring remedial program ended.[3] The summer program extended over 47 meetings: 39 week-day classes and eight Saturday sessions. Systematic data were recorded only on week-days, since Saturdays were devoted primarily to group participation activities.

Responses.

The responses consisted of completed units in any of three standard workbooks: The New Practice Reader, The Practice Workbook and Arithmetic, and Individual Corrective English. The characteristics of the New Practice Reader were described in Experiment 1. The response criterion was the same as in that Experiment.

In The Practice Workbook of Arithmetic and Individual Corrective English, each page was considered to be a unit. Directions were given at the top of the page and the problems to be worked appeared immediately below. The number of arithmetic problems on each page varied from about 40 regular computations to about 15 "story problems." In the Individual Corrective English, a unit consisted usually of 20 to 25 sentence-items. Each unit involved a topic such as punctuation, proper nouns, or complete and incomplete sentences. Points were given for each correct sentence-item, regardless of the number of components involved in a particular sentence. A few sections did not follow the above format; for example, one set of directions instructed the student to write a friendly letter. These few sections were deleted in order to keep the remaining units as uniform as possible.

In order for points to be earned or for a response (a completed unit) to be counted in the data, a criterion of 75% correct had to be met for units in both books.

Procedures. Classes during the summer program lasted three hours. The first hour involved a variety of activities such as writing themes and letters, or looking up identification questions in reference books. The third hour consisted of group participation activities such as oral reports, oral reading, and academic games. During the middle hour, the daily experimental session was held. It was described to the students as "free choice time". They were instructed that they could work on any material they pleased but that they would only receive points for working in the three workbooks described above. They were not allowed to work in these books at any other time.

During a baseline period all of the 11 students received the same number of points for working in the three books. Each correct answer in the reader earned 5 points. Each correct arithmetic computation problem earned 2 points and each correct arithmetic "story" problem earned 5 points. Each correct sentence in the English workbook earned 2 points. The distribution of points, the per cent correct criteria, and the particular workbooks which could be worked to earn points were advertised by a poster in the classroom. When changes in point contingencies occured the students were told and a 3 x 5 inch card with the new point schedule was tacked to the wall of their cubicals.

After a student's behavior in the three workbooks appeared to stabilize, the number of points which he could earn in each of the books was shifted in an attempt to increase the rate of the workbook behavior which occured least frequently. For example, if after five or more sessions a student had steady rates of reading and English but a very low frequency of arithmetic the distribution of points would be shifted in an attempt to increase the rate of arithmetic. On those occasions when the initial shift in the points did not result in an increment, a second adjustment of the points was made. After changes in the workbook behaviors did occur for several sessions, the points were again shifted, either back to baseline values or to new values. Representative records are presented below.

Results. The design of this experiment makes each student a separate and independent miniature investigation. However, the students responded in either of two very typical ways, with one exception. Consequently, the results of two prototypical students and of the single exception, are presented below as a summary of the experimental outcome.

Student GP's baseline response pattern was similar to that of about a third of the students. All of the students recorded responses in the three workbooks during the first few days of the baseline condition. However, the behavior of four of the eleven students (including GP) quickly dropped to zero in two of the workbooks but continued in the third. GP and one other student worked primarily on English, one student did nothing but read, and another worked almost exclusively on arithmetic. When the number of points which could be earned in the workbooks was shifted, their rates of working in the three books shifted correspondingly.

For GP, baseline condition (six sessions) allowed reading responses to earn 5 points (R 5), arithmetic responses to earn 2 or 5 points depending on whether they were computation or story problems (A 2, 5), and English responses to earn 2 points. During these sessions, GP worked primarily on English. His reading and arithmetic rates fell to zero after the second session. These rates are shown in Figure 2.

Then, for 12 sessions, the points were changed, so that reading responses earned 8 points (R 8) arithmetic responses earned 2 or 5 points (A 2, 5) and English responses earned 1/2 point (E 1/2). This produced a substantial increase in reading, no effect on arithmetic, and a significant drop in English.

The point contingencies were then returned for 6 days to the baseline conditions: where reading earned 5 points, arithmetic 2 or 5 points and English 2 points (R 5; A 2, 5; E 2). On this occasion the baseline point value maintained a higher rate of reading and a lower rate of English than previously. The arithmetic rate remained at zero.

The fourth condition, lasting six sessions, changed reading to zero points, arithmetic to 5 or 10 points and English to zero points (R 0; A 5, 10; E 0). During this phase, the first arithmetic in over a month occurred, and reading and English fell to zero.

The final condition was reading at 5 points and arithmetic and English at zero points (R 5; A 0; E 0). It produced a decrease in arithmetic, held English to zero, and re-established reading.

Figure 2 goes about here

Student TH was one of seven students who normally worked in at least two of the workbooks. Extensive baselines were taken in some cases. The record of TH was typical, showing the alternation among the workbooks which often occured.

Figure 3 goes about here

TH remained under baseline conditions, where reading responses earned 5 points, arithmetic 2 or 5 points and English 2 points (R 5; A 2, 5; E 2) for 22 sessions. During baseline, TH generally alternated between English and reading, arithmetic remaining at zero after the first day, as shown in Figure 3. By changing the points to zero for reading, 4 or 8 for arithmetic

and zero for English (R 0; A 4, 8; E 0) for nine sessions, her arithmetic rate was increased to an average of about 2 units a session; meanwhile, her English and reading rates were consistently zero.

The final condition lasted eight sessions. Reading responses earned 5 points, and arithmetic and English earned zero points. This produced zero rates of arithmetic and English, and a reasonably steady rate of reading.

Student CH was unusual: he worked in all three notebooks for an extended period of time. His baseline condition lasted for four weeks. The first change in condition shifted reading to 8 points, arithmetic and English to zero points (R 8; A 0; E 0) which made all his points contingent upon reading. As in the case of GP and TH above, the anouncement of "no points" reduced arithmetic and English workbook rates to zero. However, when the baseline condition was reinstated the pattern of behavior observed under the baseline condition (work in all three books) returned only temporatily: he then returned to reading exclusively.

Figure 4 goes about here

Discussion of Experiments I and II. In every case, shifts in the point contingencies led to shifts in the workbook behavior of the students. Shifts in point values to zero produced immediate cessation of behavior. Lesser shifts produced intermediate and more variable changes. Again, it is clear that the token reinforcement system functioned as such.

There was one type of irregularity that did occur in the data of several of the subjects. As with GP and CH, when the points were shifted to produce a high rate of reading, a return to baseline condition often did not return the reading behavior to its original level. Apparently, exposure to reading changed the operant level of the reading behavior. No similar effect was observed for arithmetic or English.

OTHER CONTINGENCIES

A number of other contingencies were provided in the program. Their functions were not systematically analyzed; however, they did seem to operate as intended. They are included here to provide a complete description of the program.

Contingency for the Instructors. In an effort to encourage maximally effective instruction, a monetary contingency was arranged for the instructors which was linked to the productivity of the students within their charge. Every six weeks, for each child whose six-weeks report

card grade average improved over his previous six-weeks report, a bonus of ten dollars was given to the two assistant instructors.

Contingencies Involving Further Academic Work. Favorite subjects or popular academic activities were in some instances reserved for presentation only after completion of work in a less favored subject area. One boy, for example, who asked for Junior High arithmetic materials, was told that as soon as he correctly spelled all of his current spelling words, he would receive instruction in the desired area. Children were often given their choice of activities following the completion of material in a deficient area with less than 5% error.

Academic productivity was often followed by permitting the productive student to instruct other students in their dificient areas. Good students were allowed to check materials completed by other students.

Students frequently asked to continue their academic work after the 2 1/2 hour remedial session. For good work, they were given additional assignments to take home.

Contingency for Attendance. A 100 point bonus was given each month to every student who had perfect attendance for that period. The bonus was cumulative, in that 200 points were given after two months perfect attendance, 300 after three months, and so on.

Contingency for Good Behavior. A blackboard containing the names of all the children was placed in front of the classroom. An alarm clock was set to go off at variable intervals during the remedial session, usually about 3 times during the 2 1/2 hour period. Any child who was out of his seat for any reason when the alarm sounded received a mark after his name on the blackboard. Any other disruptive behavior, such as hitting another student, resulted in a mark being placed after the offender's name. At the end of each day, the child with the fewest marks received a sixty-point award in his ticket booklet. The others received a number of points between sixty and zero, depending upon their position in the hierarchy of blackboard marks. The student with the highest number of marks received no points at all in this way. When more than four marks were received during any one day, some privilege was lost, for example, being denied use of the "store" at the end of the day.

Contingency for Report Card Average Improvement. A party was held shortly after the end of each six-weeks report card period for all students whose grade average improved over that of the previous six weeks. Maintenance of a B average or better also qualified students

for the party. The parties consisted of such activities as dining out at a restaurant, camping, and going on an airplane ride.

Contingencies from the Regular School Teachers. Teachers in the public school classroom were given the opportunity to give points to, or remove the store privilege from, the students in their classrooms. A form was distributed to the public school teachers on which they could indicate occasions of academic excellence or inappropriate classroom behavior. The children brought the reports to the remedial classroom in sealed envelopes. A report of excellence (the criterion of which was left to the teacher's discretion) resulted in 50 bonus points. A report of inappropriate conduct resulted in denying the use of the store to the student until the following day.

Contingencies for Members of the Student's Family. Items which could be used as gifts for members of a student's family were available in the store and could be purchased with pink tickets. Shaving lotion, safety razors, shampoo, toys particularly appealing to primary level children, and clothing in a variety of sized were included. Such gifts were intended to interest the members of the family in the student's academic achievements and his participation in the program.

Contingencies from the Natural Environment. Token rewards were often effective in bringing about the acquisition of a behavior, but whenever possible the goal of this program was to bring the behavior under the control of the natural consequences of such behavior.

Purchases made either with tickets or real money, and the calculations necessary before the distribution of points, required a functional use of newly acquired arithmetic skills. Reading skills were to some extent maintained by requiring the students to do exactly as the directions of an assignment required in order to receive points for their responses. Comics and other high interest reading materials were made available to the students in a effort to maintain reading skills by consequences other than points.

Contingencies for Teams of Students. Token contingencies were arranged for subgroups of the students. On Saturdays, group games similar to T.V.'s College Bown were conducted to encourage cooperation among students as well as to increase group participation skills. Several teams, consisting of two individuals each, competed against one another for a forty-point bonus to be given to the team accumulating the most correct responses. Each members of

a team received points for every correct response by either of them. It was necessary for each member of the team to emit at least one correct response in order to qualify for the bonus given to the winning team. The students were permitted to choose their partners. This was done in an effort to place students who responded well in these activities in a situation similar to that of the athlete who does well in games during recess: he is sought out as a hero and a desirable teammate by his peers.

Each group of five or six students who worked regularly with one of the instructors competed with the other two groups in accumulating tests with 'A' grades from the public school. An announcement was made to the whole class each time a student brought in such a paper. The 'A' paper itself was thumbtacked to one of the partitions at the side of the student's desk. At the end of the week the team receiving the highest number of 'A' papers was treated to candy bars of their choice.

EVALUATION OF THE TOTAL REMEDIAL PROGRAM

A primary goal of the program was to help the students make larger than usual gains in their academic skills. In order to evaluate the progress of the students in the program, indications of their academic achievement during the year were compared with those of a control group. The control group went to regular school and had no remedial program at all.

Students

The 6th grade students for the remedial program and for the control group were chosen in the following manner. The names of students were placed in rank order according to their degree of reading deficiency as measured by the SAT. The lowest scoring student was assigned to the remedial classroom group, the next lowest to the control group, etc. This procedure was continued until 15 students had been assigned to each group. As described earlier, for special reasons one 5th grade girl was enrolled in the classroom. A 5th grade girl with the same reading score and a similar report card grade average was added to the control group.

One of the 6th graders in the classroom group was lost during the spring term. She married and dropped out of school and out of the remedial program. The control group had also been reduced to 15 during the spring term as a result of a child moving. Thus the [illegible] made at the end of the year involved only 15 students in each group.

The median characteristics of the control group were the same as the remedial classroom group which was described earlier, except that the average six-weeks report card grades of the control group was slightly higher, at 3.7, as compared to 4.1 for the classroom group (A = 1.0 and F = 5.0).

Procedures and Results

Stanford Achievement Test. During each of the preceding two years the median gain made by the experimental and control groups on the SAT administered by the public school had been 0.6 years. The gains during the year of the remedial program made by the experimental and control groups were compared by using the Mann-Whitney U Test, one tailed (Siegel, 1956). The median gain of the remedial group on the Total Battery of the SAT was 1.5 years as compared to a median gain of 0.8 years for the control group. Thus, the rate of gain for the remedial group was almost twice that of the control group. The remedial group gains were significantly greater (at better than the .01 level of confidence).

Report Card Grades. Gains in report card grades of the remedial and control groups were analyzed using the Mann-Whitney U Test, and tailed (Siegel, 1956). The last six weeks report card grade averages of the year of the remedial program, and of the previous year, were compared. The median gain of the remedial group was 1.1 grade points from slightly below a 'D' to a 'C' average while the gain by the control group was 0.2 of a grade point. The gain of the remedial group was significantly greater (at better than the .005 level of conficence).

Attendance. The attendance in the remedial program averaged 85%, with a range from 65% to 100%, though the program met on Saturdays and most regular school holidays. (The decision to work on regular school holidays was determined by a vote of the students. If a majority voted that the remedial program be held on a holiday, class was conducted on that day. Without exception, the children chose to have class every holiday that a choice was given. The only holidays that class was not held were the Thanksgiving and Christmas holidays - when the instructors somewhat undemocratically chose not to work.)

Cost. The students earned an average of $225.00 in points during the school year. The range among the students was from $167.05 to $278.08. These amounts did not include the cost of the improvement parties. The costs of the points and the improvement parties combined averaged about $250.00 per student during the school year.

Discussion

The results indicate that the students benefited substantially from the remedial program. Not only did they gain, on the average, a full year's advancement in their achievement level; they also gained an additional half year in their previously accumulated deficit.

The comments by the regular school teachers (for what they are worth) suggest that the remedial program benefited the regular school classroom as well. They stated that not only were the children in the program helped, but that the increased participation and "changed attitudes" of the remedial program children increased the productivity of the other children in the regular school classrooms.

Although the control group, on the average, made only about half the gain of the remedial group, individual children in the control group acquired significant gains. One 6th grade boy in the control group made the highest gain in report card grades of all the children. However, perhaps very significantly, some of the control group children regressed in their standard achievement test scores and made lower report card grade averages than the previous year. No child in the remedial group showed any such regression.

The remedial program's effectiveness in maintaining the children's participation was indicated by the high attendance record, and the fact that whenever the opportunity was given them the children chose to attend class on regular school holidays.

The cost of the program, which was substantial, must be contrasted with the long term cost to society in terms of human as well as economic resources lost by not educating these children adequately. The cost could be reduced significantly by utilizing the potential reinforcers which already exist in almost every educational setting. Properly used, such events as recess, movies, and athletic and social activities could be arranged as consequences for strengthening academic behavior.

REFERENCES

Ayllon, T. and Azrin, N.H. Measurement and reinforcement of the behavior of psychotics. J. exp. Anal. Behav., 1965, 8, 357-383.

Bimbrauer, J.S., Wolf, M.M., Kidder, J.D. and Tague, C.E. Classroom behavior of retarded pupils with token reinforcement. J. exp. child Psychol., 1965, 2, 219-235.

Cohen, M.L., Filipazak, J.A. and Bis, J.S. Case project; contingencies applicable for special education. Brief progress report. Institute of Behavioral Research, Inc.: Silver Spring, Maryland, 1965.

Lent, James R. A demonstration program for intensive training of institutionalized mentally retarded girls. Progress Report, Bureau of Child Research University of Kansas, February, 1966.

Siegel, S. Nonparametric statistics for the behavioral sciences. New York: McGraw-Hill, 1956.

Staats, A.W. and Butterfield, W.H. Treatment of non-reading in a culturally deprived juvenile delinquent: an application of reinforcement principles. Child Develpm., 1965, 36, 925-942.

FOOTNOTES

[1]The authors wish to express their appreciation for the help and encouragement given by Ted Gray, Director of Special Education, Kansas City, Kansas Public Schools; Alonzo Plough, Principal of Grant Elementary School; David Glass, Principal of Stowe Elementary School; and Reverend David Gray, Pastor of Pleasant Green Baptist Church. We are also indebted to Mrs. Janet McCormick and Mrs. Natalie Barge who were the assistant teachers; to Todd Risley and Donald Baer who provided valuable counsel throughout the course of the investigation; to Donald Baer and Stephanie Stolz for their critical readings of the manuscript; and to Dick Schiefelbush and Fred Girardeau who did a great deal to facilitate this research. The research was partially supported by grants: OEO -KANS CAP-6?4/1 7-9, Bureau of Child Research, Kansas University Medical Center and NICHHD-HD-00870-(02-03), Bureau of Child Research, University of Kansas.

[2]The one 5th grade student was added because her parent refused to let her 6th grade sister attend unless the 5th grader could take part as well. The 5th grade girl was two years below the norm in her SAT reading score.

[3]At midyear 16 students were enrolled in the program. However, for various reasons only 11 attended the summer sessions: one girl had married during the spring term, two students were out of town for the summer, one boy was required to stay home and "work" for his mother during the summer, and one student had moved across town and was supposed to ride the bus to class but failed to attend after the first week of summer session.

Figure Captions

Figure 1. A record of completing reading units by two students, KT and AS. Each dot represents the number of units completed during a class session.

Figure 2. A record of student GP's rates of completing units of reading, arithmetic and English in three work books. Each dot represents the number of units completed during the experimental hour each class session. The letter and number captions describe the number of points to be earned for reading (R), arithmetic (A) and English (E) under each condition. Two numbers are given for arithmetic; the first for computation problems and the second for story problems.

Figure 3. A record of student TH's rates of completing units of reading, arithmetic and English in three workbooks during the experimental hour.

Figure 4. A record of student CH's rates of completing units of reading, arithmetic and English in three workbooks during the experimental hour.

Table 1

Experimental conditions and number of sessions for each subject in Experiment 1.

Subject	Number of possible points per reading unit	Number of sessions
KT	90	19
	52	7
	90	8
	52	5
	90	10
AS	60	19
	120	20
	60	6

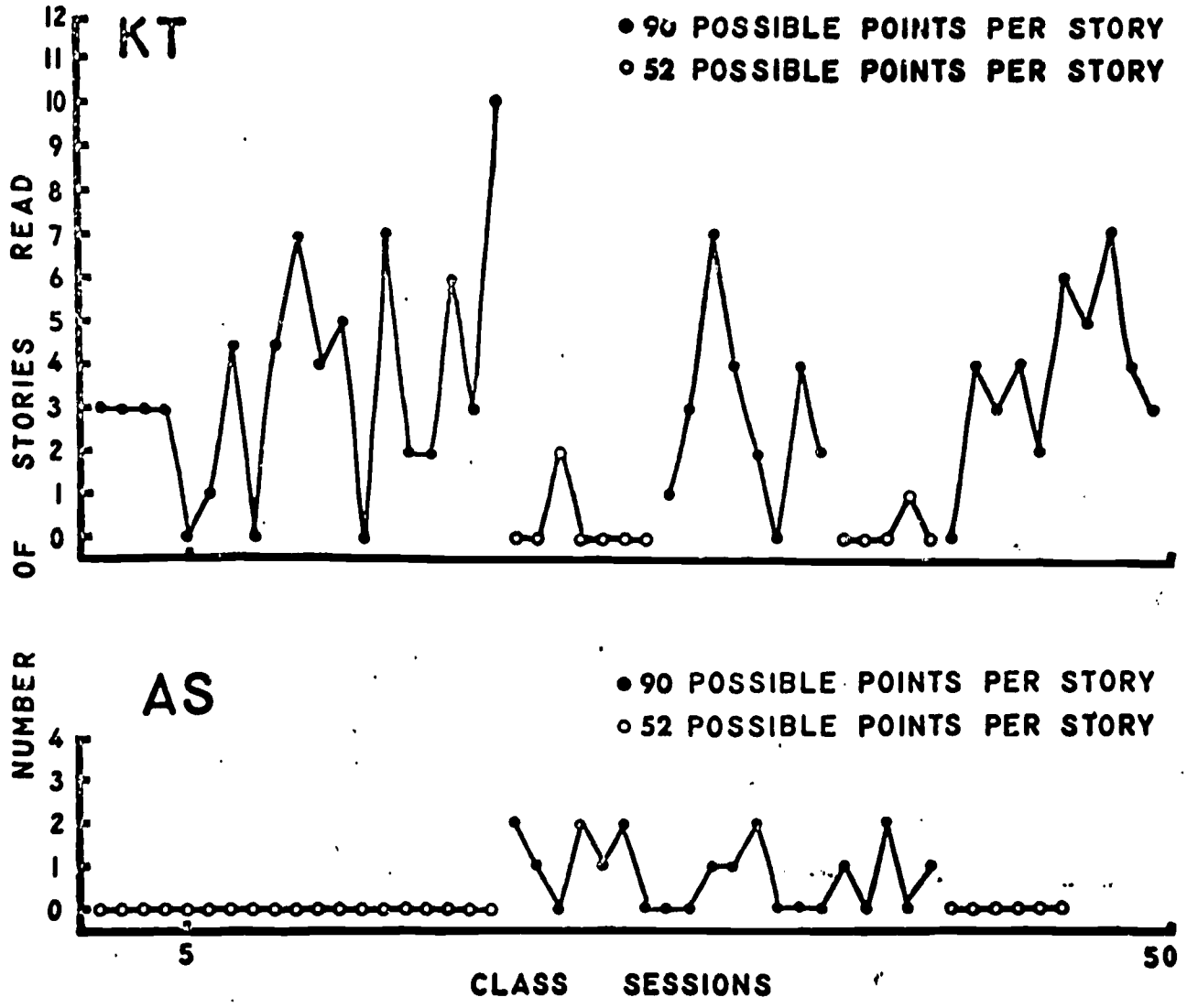
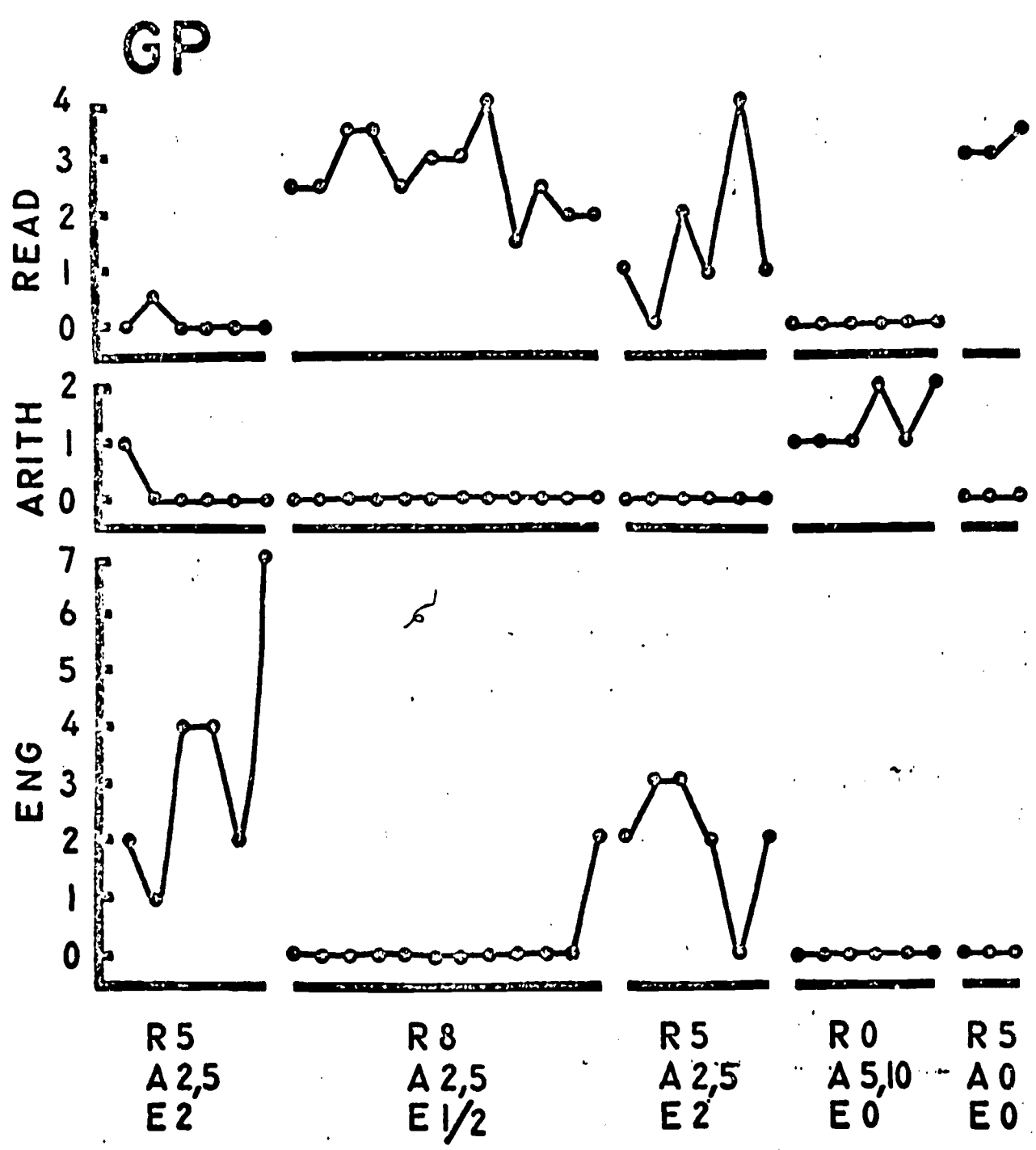

KT
● 90 POSSIBLE POINTS PER STORY
○ 52 POSSIBLE POINTS PER STORY
READ
OF STORIES
0
1
2
3
4
5
6
7
8
9
10
11
12
AS
● 90 POSSIBLE POINTS PER STORY
○ 52 POSSIBLE POINTS PER STORY
NUMBER
0
1
2
3
4
5
50
CLASS SESSIONS

Fig. 1

Fig. 2


GP
READ
4
3
2
1
0
ARITH
2
1
0
ENG
7
6
5
4
3
2
1
0
R 5
A 2,5
E 2
R 8
A 2,5
E 1/2
R 5
A 2,5
E 2
R 0
A 5,10
E 0
R 5
A 0
E 0

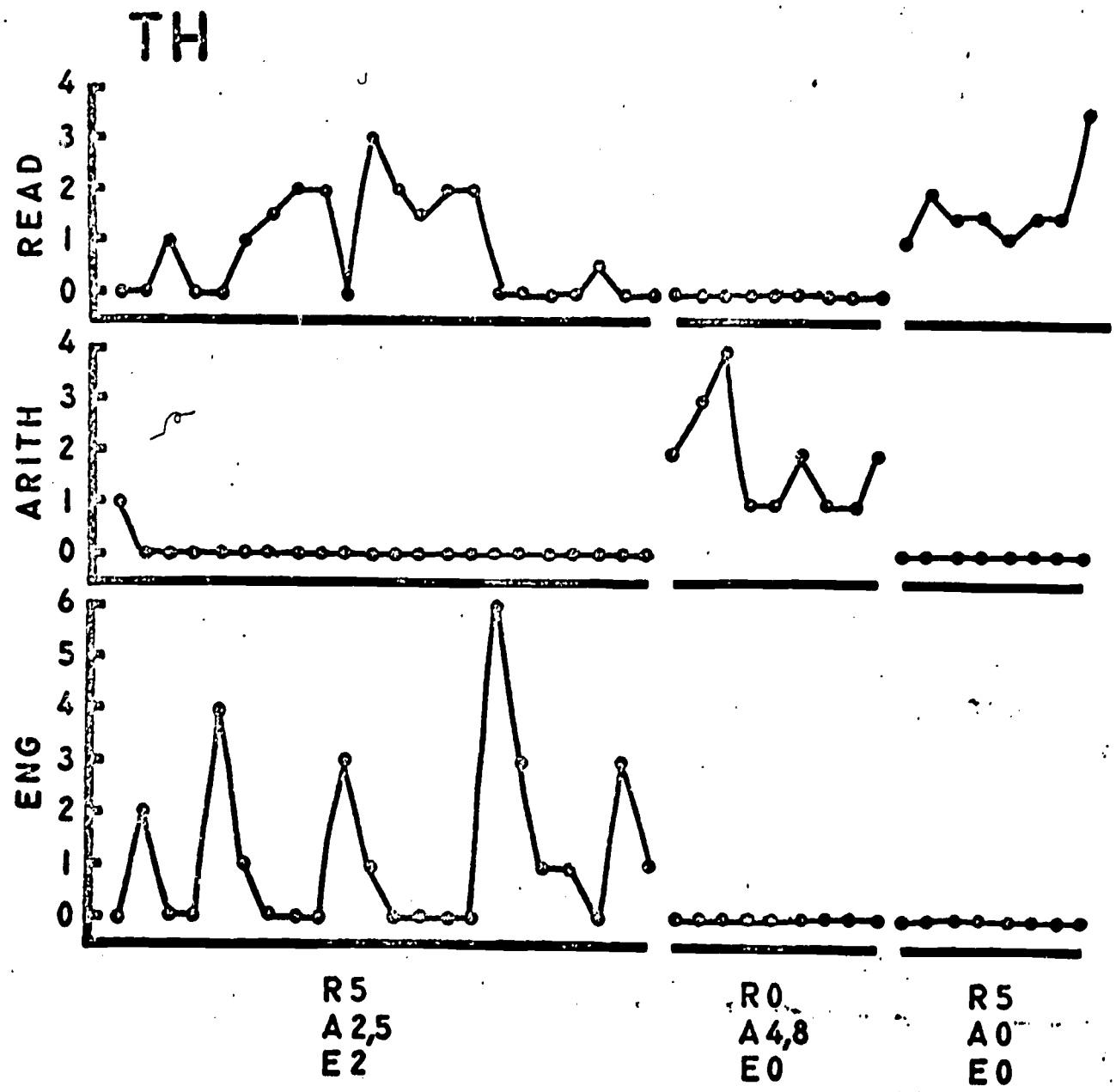


Fig. 3

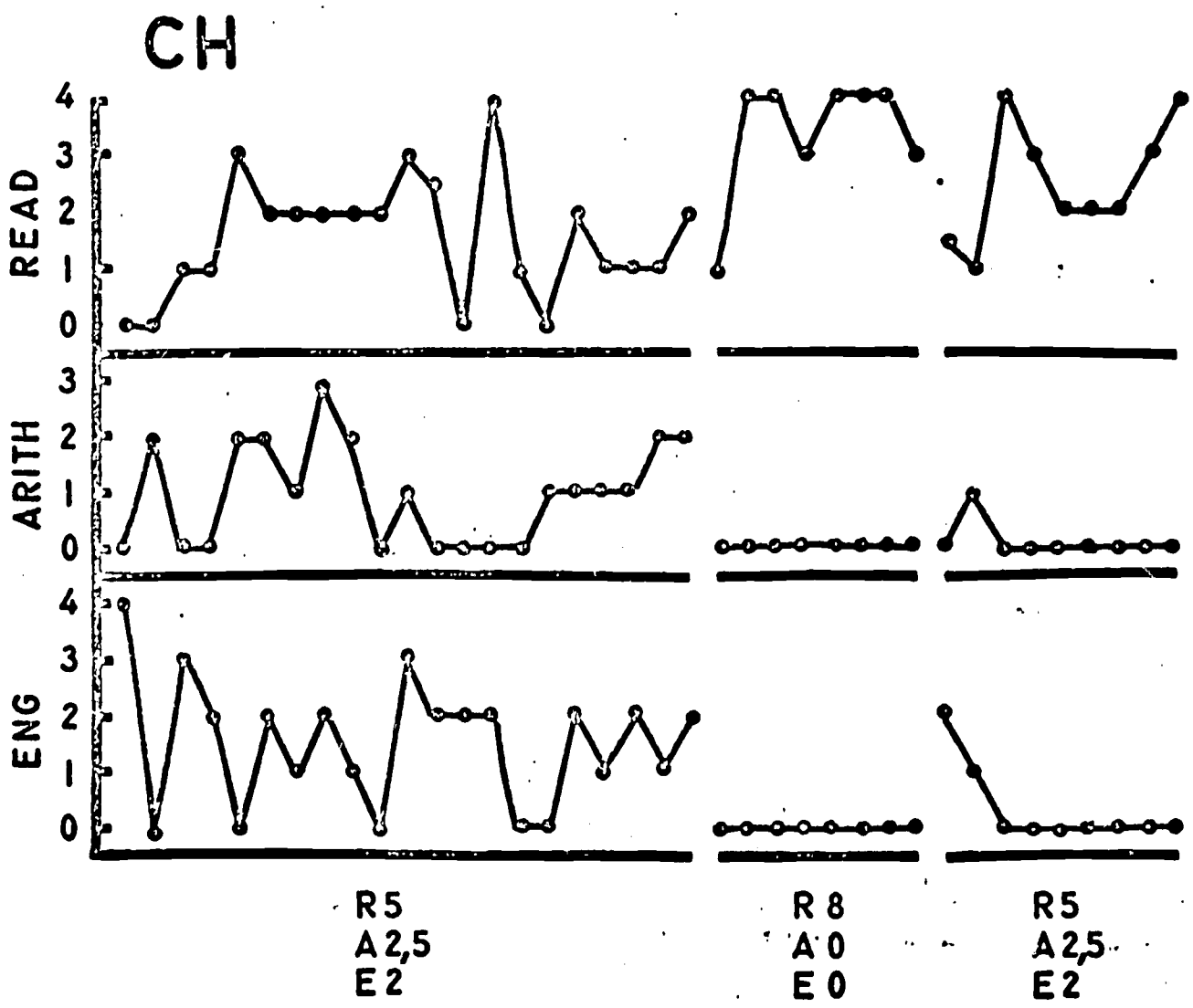


Fig. 4